BALLOON RACE FROM FORT OMAHA THROUGH THUNDERSTORMS.

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One of the events in an aerial carnival held at Fort Omaha, Nebr. on July 13 was a balloon race. There were four entrants in the race—three balloons of 19,000 cubic feet capacity, and a larger one of 35,000 cubic feet, which was known as the judges' balloon. The day, however, had been intensely hot and uncomfortable, with a somewhat gusty southeast wind, which turned to south toward evening. About 3 in the afternoon, large cumulus clouds appeared in the northwest with a layer of alto-stratus which hung low along the northern horizon. Pilot-balloon runs, which were made at frequent intervals during the afternoon, constantly showed a strong southerly wind a few hundred meters above the surface. It was contemplated that the race should start about 4 o'clock, but the rather threatening aspect of the sky, the well known antipathy of balloonists for lightning, and the increasing gustiness of the surface wind, served to postpone the start until later in the evening.

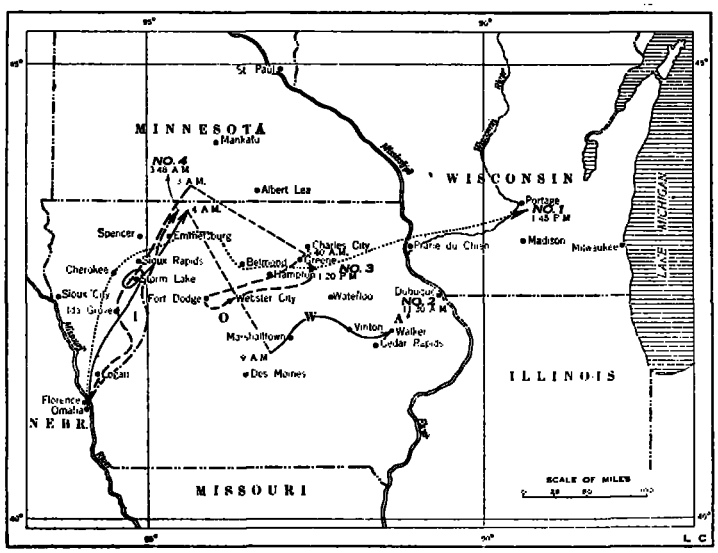

FIG. 1.—Paths of four balloons from Fort Omaha, Nebr.

About 5:30 came a sudden squall wind, which was generally interpreted to be the forerunner of a thunderstorm, for the alto-stratus had now spread around to the west so as almost to obscure the sinking sun. The squall, however, did not persist for over five minutes, and, at its conclusion, the surface wind became quite gentle. There was a slight drop in temperature. At 8 oclock, the weather having steadied somewhat, it was decided to begin the race, for there had assembled a crowd of spectators numbering several thousands. At 8:55 p. m. the first of the balloons rose slowly and gracefully from the field, followed at about three-minute intervals by the other three. The ground wind had practically died out by that time, so that the balloons, for the first 300 feet, rose almost vertically. Although the clouds persisted in the north, they had lost their threatening appearance, and it was conceded that the thunderstorm would not materialize. The more meteorologically inclined, however, looked dubiously at the low gray bank in the north toward which the balloons would undoubtedly be carried.

As the wind direction would indicate, there was a center of low pressure to the northwest, which was passing north of Omaha, and which was centered in southern Minnesota the next morning. As each balloon rose, it was caught suddenly in the more rapidly moving layer of air, and proceeded off to the north at a lively pace. The crowd disbanded after the getaway, and only a few watchers remained when the bags appeared as tiny specks in the cloud-enshrouded distance. For the crowd, the thrill was over; for the balloonists it was just beginning. The stories that were brought back to the fort by the returning balloonists seemed to indicate that they had all had their fill of ballooning in a storm.

In figure 1 are shown the paths of the four balloons, and even a cursory glance is sufficient to show how the gas bags were jostled about by the elements; to read the logs is to appreciate in some small measure the wildness of the ride.

Balloon No. 1, piloted by Lieut. Richard E. Thompson, with Lieut. James B. Jordan as aide, was the first to get away. It proceeded in a general north-northeasterly direction for the first six hours, after which it turned more easterly and began an ambling journey thorough northeastern Iowa. At 11 the following morning the Mississippi River was crossed just north of Prairie du Chien, Wis., and for the following two and three-quarters hours the balloon proceeded up the valley of the Wisconsin River. A landing was effected at that time, not so much because of immediate necessity, but because the experience of the preceding 16 hours had taught the travellers the true significance of an immense, dark, anvil-shaped cloud which seemed to be racing toward them from the south. Had it not been for this precautionary landing, there is little doubt that this balloon might have reached the shore of Lake Michigan.

The experiences of balloons 2 and 3, carrying Capt. A. C. McKinley, pilot; Lieut, James T. Neely, aide; and Lieut. W. E. Huffman, pilot, Lieut. W. E. Connolly, aide, respectively, are perhaps more striking because of the serpentine nature of their paths. Balloon No. 2 apparently encountered a whirl of several miles diameter in the vicinity of Storm Lake, Iowa, for their log shows that at midnight there were about 7 miles northeast of that place, and an hour later they were directly over the town, after which they proceeded in a northeasterly direction until they were lost in the clouds at 4 in the morning. For five hours they rode thus, uncertain as to their position and only occasionally getting glimpses of the countryside. When, finally, their position was determined they were about 20 miles southwest of Marshalltown, Iowa, a point considerably southeast of the place where they lost their way. They landed in eastern Iowa. Balloon No. 3, aftr leaving Omaha, pursued a general northeasterly course, but was also lost in the clouds in southern Minnesota. It, too, was carried southeasterly in the clouds and at 5:40 a. m. was traveling in a southwesterly direction over Greene, Iowa. An interesting loop was executed about the town of Fort Dodge, after which they journeyed back almost to Greene on a path parallel to that of their approach toward Fort Dodge.

Balloon No. 4, carrying Mr. A. Leo Stevens, pilot; Lieut. Col. Jacob W. S. Wuest, and Major M. J. O'Brien were forced to land at 3:48 a. m. They followed a northeasterly course, which was also quite irregular.

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Free balloon in flight at altitude of 1 mile. (Photo taken from aeroplane.)

All the logs record passing through severe storms of thunder and lightning, rain, and wind. Balloon No. 1 apparently experienced the first of the storm at 11:15 p. m., although lightning had been visible for an hour and a half. Balloon No. 2 makes no mention of the storm until 3:30 a. m.; balloon No. 3 mentions rain at 2:40 a. m., and No. 4 entered the storm at about the same time. Some of the notes recorded by the aeronauts will serve to show briefly the very violent state of the atmosphere:

Balloon No. 1 at 11:25: "10 miles west of Ute. In terrific whirlwind. Very bad time. Basket straight out. Lightning close above and all around." and 15 minutes later, "Soaking wet and cold." At 2 a. m.: "Very bumpy wind; basket swaying; rain; lightning in all directions."

Balloon No. 2 at 3:30 a. m.: "In thunder and lightning storm; rain drove balloon down and drag-rope touched several times but basket did not. Decided to ride it out. Very high winds." At 8:30 a. m.: "Valving down before another approaching thunderstorm; will not land but ride it out low as before."

Balloon No. 3 at 3 a. m.: "In severe electrical storm; raining."

Balloon No. 4 at 2:45 a. m.: "Have entered thunderstorm; lightning on all sides." At 3:48 a. m.: "Landed. * * * Terrible rain and lightning."

Table of altitudes and directions.

Time.	Balloon No. 1		2		3		4	
	Altitude (feet).	Moving toward.	Altitude (feet).	Moving toward.	Altitude (feet).	Moving toward.	Altitude (feet).	Moving toward.
10 p. m.	900	NNE.	2,450	NNE.	2,000	NE.	2,300	NNE.
11 p. m.	1,400	N.	2,100	NNE.	2,000	NE.	2,500	NE.
12 m.	1,800	N.	2,100	NNE.	1,500	NE.	2,650	NE.
1 a. m.	2,500	NNE.	3,000	NNE.	2,000	NE.	2,650	NE.
2 a. m.	2,700	NE.	3,300	NE.	2,000	NE.	3,300	NE.
3 a. m.	3,000	NE.	3,600	NNE.	6,000	NE.	3,800	N.
4 a. m.	1,300	NE.	3,800	(1)	6,000	(1)	.....	.....
5 a. m.	1,400	(1)	4,000	(1)	2,800	(1)	.....	.....
6 a. m.	5,000	S.	1,400	SSE.	3,100	SW.	.....	.....
7 a. m.	5,200	E.	1,800	SE.	1,800	SW.	.....	.....
8 a. m.	5,200	E.	4,300	E.	800	SW.	.....	.....
9 a. m.	6,800	NE.	1,700	ENE.	2,000	E.	.....	.....
10 a. m.	7,500	ENE.	7,150	E.	2,000	SE.	.....	.....
11 a. m.	4,500	E.	3,700	E.	2,200	NE.	.....	.....
12 m.	500	ENE.	.....	.....	800	N.	.....	.....
1 p. m.	9,000	ENE.	.....	.....	2,000	N.	.....	.....

[1] Balloons lost in clouds.

In order to discover, if possible, any uniformity in the changes of wind direction at various altitudes, the preceding table was compiled from the logs for each balloon for each hour of flight, showing the altitude of the balloon and the direction of the wind. It must be remembered that the direction of motion is often slightly in error, owing to the fact that it is determined only by the judgment of the observer; and if it happens, as it did in this case, that points of reference are not readily distinguishable, it is possible that the error might be very large.

Classifying the wind directions by altitudes and time, we find that the reason for the unfortunate conduct of the balloons is to be found in the fact that they were all affected by a wind shift line in the southern half of the cyclone. This line seemed to pass the balloons in the early morning, for up to that time all directions were, in general, toward the northeast—that is, a southwest wind. After that time the directions are, in general, toward the southeast or east—that is, a northwest or west wind. Of course, there are isolated discrepancies, but these are obviously due to local phenomena, such as whirlwinds or eddies, or to the personal equation of the observer.

While these flights were not made with any intention of being of scientific nature, nor even were there any hopes of records being established with balloons of so small capacity, we are able, nevertheless, to gather quite vividly from the experiences of these men the extent of the unrest and turbulence which must attend the life of a thunderstorm.

HEIGHT AT WHICH SOUNDS CAN BE HEARD.

In one of his journals Camille Flammarion gives the heights at which sounds from the earth are heard from balloons. The shout of a man was heard distinctly at a height of 1,600 feet, the sharp note of a mole-cricket at 2,500 feet, and the croaking of frogs in a morass at 3,000 feet. At 3,255 feet a man's voice and the rolling of a cart were distinguished; at 4,550 feet the roll of a drum and the music of an orchestra; at 5,000 feet the crowing of a cock, the sound of a church bell, and sometimes the shouting of men and women. Nine hundred feet higher still was heard the report of a musket and the barking of a dog. The noise of a railway tram penetrated to a height of 8,200 feet, and the whistle of a locomotive engine to nearly 10,000 feet.—*Scientific Amer., July 27, 1918, p. 63.*